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Public Service Commission of Wisconsin
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ENVIRONMENTAL ASSESSMENT

for

**Northern States Power Company-Wisconsin
Bay Front Gasifier Project**

Docket 4220-CE-169

Request for Approval to Construct a Biomass Gasifier at
the Bay Front Generating Facility

**September
2009**

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1.0 Introduction

Northern States Power Company-Wisconsin (NSPW) applied to the Public Service Commission of Wisconsin (PSC or Commission) for authority to construct, install, and place in operation equipment that will produce synthetic gas (syngas) from biomass for the production of electricity at the company's existing Bay Front Power Plant (Bay Front) in Ashland, Wisconsin.¹ The Commission, if it approves the project, will issue a Certificate of Authority (CA) to NSPW.

This is a Type II action under Wis. Admin. Code § PSC 4.10(2). Under Wis. Admin. Code § PSC 4.10(2), Table 2.bg, an environmental assessment (EA) is needed for the review of a biomass or waste-to-energy electric generation facility project. Under Wis. Admin. Code § PSC 4.10(2), Table 2.d, an EA is needed for the review of a project in which a generation facility's fuel type is changed.

Notification of the Commission's intent to prepare an EA, including a solicitation for comments on the environmental aspects of this project, was mailed to the entire project mailing list, consisting of nearly 500 persons or entities, on April 17, 2009.² Because of the broad geographical scope of the potential project impacts, the notification was distributed to:

- Legislators representing the area within 100 miles of Ashland;
- The clerks of each county, city, village, and township within 100 miles of Ashland;
- Local news media that serve the areas within 100 miles of Ashland;
- The North Central Wisconsin Regional Planning Commission and Northwest Regional Planning Commission;
- County foresters and extension agents serving counties within a 100-mile radius from Ashland;
- Forty-eight libraries serving the area within a 100-mile radius of Ashland;
- The Living Forest Coop, WTFC Tree Farm, and Wisconsin Woodland Owners Associations; and
- Other persons with a demonstrated interest in the project.

Responses to the notification included one telephone call to Commission staff and a comment filed on the Commission's internet site. One of the responses applied indirectly to the project and potential content of the EA.

The Gas and Energy Division of the Commission prepared this EA in cooperation with the Wisconsin Department of Natural Resources (DNR) Office of Energy to determine if an environmental impact statement (EIS) is necessary under Wis. Stat. § 1.11. The draft EA was distributed by e-mail to the parties in this docket. It was also made available to persons or offices on the docket mailing list through the Preliminary Determination letter issued on August 4, 2009.³ Comments on the draft EA were received from Clean Wisconsin,⁴ Citizens'

¹ PSC Reference #108437.

² PSC Reference #111808.

³ PSC Reference #117858.

⁴ PSC Reference #118575.

Utility Board (CUB), and the applicant. Two members of the public requested copies. Neither provided comments.

A hearing on the project was held as requested by the Commission in August 2009. Three issues were listed in the Notice of Hearing.⁵ These were:

1. Should the Commission grant a CA for the proposed project, pursuant to Wis. Stat. §§ 1.12, 196.025, 196.377(1), 196.378, and 196.49, and if so, subject to what conditions?
2. Will production and acquisition of the fuel occur in a manner that is ecologically sound?
3. Are the sources of wood fiber adequate to provide fuel for the project and raw material for paper manufacturing and other industries?

The draft EA was also a topic of discussion in the Commission hearings on the case. It, along with the Preliminary Determination letter, was submitted as an exhibit by Clean Wisconsin.⁶ The need for clarifications or additions to the EA was raised in prefiled testimony and cross-examination at the hearing. Members of the public who testified during the hearing did not comment on details of the project or the EA.

2.0 Project Description

2.1 Facility Background

The Bay Front Power plant was originally constructed in 1916, and boilers were added after that time. NSPW currently maintains three boilers that feed into a combined steam header system that supports three turbine generator sets. The boilers have burned coal, waste wood, railroad ties, tire-derived fuel, natural gas, and petroleum coke to produce the steam. Boiler 1 and Boiler 2 have 22 megawatts (MW) of capacity each. The capacity of Boiler 5 is about 28 MW.

Since 1979, the plant has burned biomass, much of it waste material from local timber processing firms, as a principal fuel in Boilers 1 and 2; some coal is also burned. In 1991, the plant was fitted with an upgraded air quality control system including two gravel bed filters designed to remove 98 percent of the particulate matter from the flue gas. In 1999, these two boilers were modified with auxiliary natural gas burners to improve operating efficiency while burning wood. In 2008, nitrogen oxide (NO_x) emission control equipment was installed on both boilers.

The principal fuel for Boiler 5 has been coal. However, because of the plant's emission limits and problems with slagging in the boiler, the type of coal that can be burned is somewhat unique. It is limited in its availability and expensive, due to the transportation issues involved in delivering it to the Bay Front plant.

⁵ PSC Reference #117008.

⁶ The draft EA is PSC Reference #118492. The letter is PSC Reference #117858.

2.2 Project Purpose and Need

NSPW indicates that it cannot continue to rely on coal for Boiler 5 because of these coal supply and cost issues, and also because the costs of environmental compliance related to continued coal burning are expected to increase significantly. The costs relate specifically to compliance with the Clean Air Interstate Rule (CAIR) and with recent state regulations on mercury (Hg) emissions. If operations at Bay Front are not changed, Boiler 5 might need to be retired to avoid the costs of NO_x allowance shortfalls under CAIR. There would also be additional costs to install Best Available Control Technology (BACT) for Hg by January 1, 2015, as required by Wis. Admin. Code ch. NR 446. The BACT for Hg would likely include installation of an activated carbon injection system and fabric filter baghouse to capture the contaminated carbon before it leaves the exhaust stack.

The company has decided to address these potential problems by applying for authority to:

- (1) modify Boiler 5 to burn natural gas and syngas derived from biomass instead of coal; and
- (2) build and operate a new biomass gasifier to produce the syngas.

The proposed project also is meant to help the NSPW system as a whole comply with Wisconsin and Minnesota carbon dioxide (CO₂) reduction requirements and with the Resource Plan the company has developed for the Minnesota Public Utilities Commission. The company states that the project could help NSPW meet its Wisconsin Renewable Portfolio Standard (RPS) requirement to have 12.85 percent of its energy come from renewable resources by 2015 and help Northern States Power Company-Minnesota (NSPM) meet its Minnesota Renewable Energy Standard (RES) requirement to have 30 percent of its customers' energy needs met with renewable resources by 2020.

2.3 Project Location

The Bay Front Power Plant is located on about 50 acres of land jutting out from the main shore of Lake Superior's Chequamegon Bay in Ashland, Wisconsin, in the northwest ¼ of the northwest ¼ of Section 5 in Township 47 north, Range 4 west. It is surrounded on three sides by the bay and separated from the rest of Ashland by U.S. Highway (USH) 2. See Attachment A.

Because a major portion of the biomass fuel would come from the Wisconsin landscape, the region affected by the potential fuel supply must be considered as well. According to the company's application, fuel for the plant would be primarily wood waste from wood product firms and logging residues from forests in Wisconsin, Michigan, and Minnesota counties within a 100-mile radius of Ashland. At the technical hearings for this case, NSPW also indicated that because there is currently a virtually guaranteed supply of locally available pulpwood at fairly low cost (due to the decreased market for this commodity and the nature of many logging contracts), it may utilize some pulpwood (roundwood) in the gasifier when conditions merit such use.

NSPW has indicated that most sources of wood waste, residues, and pulpwood for the project would likely be within a 50- to 70-mile radius of the plant site. See Attachment B. The application also states that, for the future, the company is "exploring the feasibility of developing

biomass plantations and grower cooperatives” within that same radius. In all cases, NSPW would not obtain its own fuel but would contract with other entities to obtain fuel for Bay Front. It is expected that the gasifier project would eventually double the current rate of biomass use at the Bay Front plant.

2.4 Siting Process

The project is basically a repowering project at an existing power plant site. Because the purpose of the project is to address potential economic difficulties related to Boiler 5, the new project has been proposed to take advantage of existing facilities and infrastructure associated with the Bay Front plant and Boiler 5 in particular. All new facilities would be constructed and installed on the existing Bay Front brownfield site.

2.5 Project Design

2.5.1. Modifications to the existing Bay Front Power Plant

There would be four primary modifications made to Bay Front as part of the proposed project. They are:

- Installation of additional biomass receiving, storage, and handling equipment;
- Installation of a biomass gasification system;
- Modification of Boiler 5 to burn syngas effectively to make steam for an existing turbine; and
- Addition of enhanced flue gas filtering equipment to capture residual particulates.

The biomass receiving, storage, and handling equipment would be located at the south end of the existing coal storage area. See Attachment C. Attachment D shows the arrangement of the existing facilities on the plant grounds. The new gasifier would be located at the site of the existing welding shop and maintenance building, as well as where retired Boilers 3 and 4 were located, north of Boilers 1 and 2. Comparing Attachment C with Attachment D illustrates the facility changes that would occur.

2.5.2. Gasification of biomass

The gasification process includes heating the biomass in the presence of a limited proportion of air or oxygen to generate syngas. In the proposed project design, the gasification process is a combination of partial oxidation of hydrocarbons and de-volatilization of fuel. The syngas is a mixture of carbon monoxide (CO), CO₂, methane (CH₄), longer chain hydrocarbons, and hydrogen (H₂). This mixture is expected to burn more efficiently and cleanly in the modified boiler than solid coal or woody biomass. Emissions of NO_x, sulfur oxides (SO_x), Hg, CO₂, and other pollutants would be less than those from burning coal.

The expected gasifier technology would be circulating fluidized bed (CFB), although other configuration options such as fixed bed remain under consideration as the company's project

planning and procurement proceed. The company has not formally selected a biomass gasification technology at this point. As a retrofit of the existing plant, the project would be less expensive than a new greenfield biomass-fired plant, regardless of the choice among technologies being considered.

CFB technology utilizes limestone as the bed media and can handle a variety of low-grade fuels with high gasification efficiency. With this technology, the biomass would be injected into a heated, CFB furnace in the presence of less than 50 percent of the air necessary for combustion. With the syngas driven off in 1,000°F to 1,600°F heat, ash and carbon would remain to be removed. Syngas energy content would be around 100 to 200 British thermal units (Btu) per standard cubic foot.

2.5.3. Combustion of syngas and generation of electricity

With 100 percent syngas, Boiler 5 would have an electric generating capacity of 20 MW. If the syngas is combined with natural gas, the capacity could reach 28 MW. The total generation capacity at Bay Front would not be expected to change significantly as a result of this project. According to its application, the company would treat the energy produced as a “must take” resource for the purpose of maximizing the production of renewable energy credits.

2.5.4. Biomass supply

The proposed project would consume up to 200,000 to 250,000 green tons of biomass each year, in addition to the biomass already supplying energy for Boilers 1 and 2. This would result in a combined need of 400,000 to 450,000 tons of biomass per year for the Bay Front Power Plant.

The company has assumed that fuel might be brought in from an area up to 100 miles from the plant, but that most would be brought from within 50 to 70 miles away. Attachment B shows the area within 50 and 100 miles of Ashland. NSPW indicates that the availability of an adequate supply of woody biomass for the gasifier from any source would be determined to some degree by price, half of which is the cost of transportation. Vehicle fuel would make up about 20 percent of the transportation cost. The cost and price of the fuel would increase with distance from the generating plant, and this is the basis for NSPW’s projected biomass source area.

Approximately 100,000 tons, or one-third of the biomass currently supplied to the plant, is mill residue from wood mills in the northwest portion of Wisconsin. This component of the fuel mix would be shifted to Boiler 5 for use as needed. NSPW has stated that, as more forest products firms or mills opened or expanded, the company would continue to accept their wastes.

NSPW states that, initially, most of the remainder of the fuel supply would be “lower quality, underutilized materials that are typically left unharvested” for other industries. According to the company, these materials include treetops, logging slash, damaged trees, underutilized species

like hemlock, tamarack, or cedar, and cull and mortality classed trees.⁷ Currently, 55 to 60 percent of the fuel used at Bay Front comes from underutilized trees and dead or dying trees left at existing forest harvest sites, primarily by nine different logging companies that harvest pulpwood for the paper products industry and chip material that would otherwise have been left on the harvest site. NSPW states that it anticipates an increase in the amount of material that would come from existing forest harvest sites.

Also, because of the readily available supply of pulpwood and the down-turned market for this product, NSPW indicates that it may, under some circumstances, purchase pulpwood for conversion into syngas.

The company believes that there is enough material in the projected supply area to provide the new project with the biomass it would need. During the project hearing, witnesses for Clean Wisconsin and the Wisconsin Paper Council disagreed with the company. Both entities expressed concern that NSPW has overestimated the amount of available biomass. Clean Wisconsin's witness indicated that this overestimate is in part a result of not eliminating from consideration the vulnerable lands described in the December 2008 Wisconsin's Forestland Woody Biomass Harvesting Guidelines (Guidelines).⁸ Both parties sponsored witnesses attesting to problems of supply related to competition and other economic and political pressures.⁹

For a long-term and more reliable source of biomass fuel, NSPW states that it is exploring the feasibility of creating and maintaining biomass plantations, possibly through grower cooperatives. Species on the plantations could include hybrid poplar (*Populus* spp.) or shrub-type willows (*Salix* spp.). For plantations, NSPW indicated that it would attempt to have its suppliers utilize open agricultural lands that are marginal for the production of row crops but would, within limits, leave the choice of lands to the discretion of the landowners themselves.

Grower cooperatives could operate as centralized aggregators, processors, and storage locations.¹⁰ Transport to Bay Front could be just-in-time delivery for use in the gasifier. To date, NSPW has focused mainly on existing agricultural service cooperatives that appear interested in becoming biomass aggregators for its French Island Power Plant in LaCrosse, Wisconsin, particularly Farmers Cooperative Supply and Shipping Association, a cooperative in West Salem, Wisconsin. Farmer members of the cooperative could establish energy crop plantations to produce biomass for the aggregating cooperative. The company has co-funded a study¹¹ in the French Island area to investigate:

⁷ The expert witness for Clean Wisconsin has indicated that tamarack and cedar represent saturated wetlands and have other vulnerability issues and value that should exempt them from being used as biomass fuel at the plant. Direct testimony of Professor David J. Mladenoff, PSC Reference #116944, pp. 211, 216.

⁸ Wisconsin Council on Forestry. "Wisconsin's Forestland Woody Biomass Harvesting Guidelines," December 16, 2008. <http://council.wisconsinforestry.org/biomass/pdf/BHG-FieldManual-lowres090807.pdf>

⁹ For example, Clean Wisconsin and Wisconsin Paper Council testimony in PSC Reference #119012.

¹⁰ The company indicates that it has discussed the feasibility of grower cooperatives with the Cooperative Network, and Cooperative Network corroborated this discussion through witness testimony.

¹¹ Co-funded with the Wisconsin Office of Energy Independence along with the Cooperative Network and the Farmers Cooperative Supply and Shipping Association of West Salem, Wisconsin.

- Biomass resource potential;
- Biomass aggregation, processing, storage, and transportation infrastructure needs; and
- Operational expense and pricing structure needed to support the aggregation service.

When the study for French Island is completed, the company has stated its intention to try similar arrangements with Midland Services, Inc., a cooperative in the Bay Front area.

NSPW states that it has also been working closely with a group of local Ashland leaders, including the Ashland Area Development Corporation,¹² to promote establishment of demonstration areas for biomass energy plantations. These demonstration areas would be meant to inspire participation by documenting specific establishment and maintenance costs, biomass species and varieties, environmental impacts of energy cropping, management skills, and revenue streams from plantations.

However, Clean Wisconsin's witness testified that the soils and climate are not conducive to the economic growth of hybrid poplar or similar woody biomass crops. In addition, Wisconsin Paper Council witnesses indicated that the crops would be too high in moisture content and that opportunity costs would be too high for the growers to switch from current cropping systems to dedicated fuel crop systems.¹³

2.5.5. Biomass handling on site at Bay Front

All biomass materials would be delivered to the Bay Front plant by truck. No rail facility serves the plant because the old local rail line has been converted into a bicycle/pedestrian path. NSPW anticipates an additional 25 to 40 trucks per day to deliver the fuel, although the exact number would depend on the amount of biomass each truck could bring and the decrease in the number of trucks delivering coal. Trucks would be unloaded at the plant using either self-unloading trailers or new hydraulic trailer dumping equipment on the Bay Front grounds. See Attachment C.

There is storage planned for biomass in excess of just-in-time delivery. The company's preliminary design includes a 1,500-ton storage building and a 7,000-ton outdoor storage yard. See Attachment C. The new equipment installed for handling biomass fuel would include a scale, a new trailer hoist to empty truck trailers, and conveyor systems to deliver the biomass to the storage pile, storage building, and gasifier. The storage yard would be in the southern half of the existing coal storage area near the biomass handling equipment and storage building. The northern half of the existing coal yard would remain as a coal storage facility for the coal that is still used in Boilers 1 and 2.

¹² The Ashland-Bayfield office for UW Extension, UW College of Agricultural and Life Sciences, and the Wisconsin Department of Agriculture, Trade and Consumer Protection are also involved in the demonstration development work. The executive director of the Ashland Area Development Corporation and other Ashland area leaders spoke in favor of the Bay Front project at the project hearing. This testimony is in Volume 3 of hearing transcripts, PSC Reference #118676.

¹³ Testimony in Volume 3 of the hearing transcripts, PSC Reference #118676.

2.5.6. Project cost

NSPW's current estimate of the total project construction cost is about \$58.1 million. More accurate cost estimates are not available because the technology has not been used in the U.S. at the proposed scale. Cost estimates are expected to be adjusted as project engineering continues. In comparison to five reasonable alternatives to the proposed project examined by NSPW, the company determined that the proposed project is not the least expensive of all options available, but is "only marginally more costly than the lesser cost alternatives presented." See Section 4 of this EA.

According to the application, construction of the project is expected to be financed by the company as part of its ongoing construction program through a combination of internally generated funds and external financing as approved by the Commission.

NSPW expects the operation costs to be dependent on the costs of the fuel as well as the uncertainty of technology choice for the gasifier. It is possible that fuel costs will stabilize because the company is focusing on fuel from existing sources, working with DNR to implement the new state harvesting Guidelines, and pursuing development of energy crop plantations. However, the uncertainty about fuel availability from these sources creates uncertainty about future fuel prices.

2.5.7. NSPW's expected project schedule

NSPW would like construction of the project to begin by mid-2011 and be completed by December 2012. Necessary approvals in other states would be obtained before project construction work began.

The company wants modified Boiler 5 to begin commercial operation by late 2012.

2.6 Permits and Approvals

Before construction on the proposed project is allowed to proceed, a CA is needed from the PSC.

Two DNR approvals or permits are needed.

1. The company needs an air pollution control construction permit and a modification of its existing Bay Front air pollution control operating permit before it may construct and operate the project. NSPW intends to apply for a construction permit when or if the proposed project is approved by the Commission.

It has not applied to modify the operating permit yet. There is some confidence at the company that the modification of the permit should not be problematic because the modifications to the plant would reduce all pollutant emissions.

2. The company must acquire a stormwater management permit that could be subject to review by the U.S. Army Corps of Engineers (USACE) as well. DNR Office of Energy staff indicate that this permit should not be difficult to obtain.

A significant portion of the costs of the project would be borne by customers of NSPM, including North Dakota customers, under an interstate cost-sharing agreement. Thus, NSPM would also seek approval from the Minnesota Public Utilities Commission that the project qualifies for cost recovery under the Minnesota RES rate rider and is prudent under the North Dakota Public Service Commission regulations as well.

3.0 Environmental Analysis

There are potential impacts from constructing and operating the new facilities, and from acquiring the biomass fuel. These are discussed below.

3.1 Potential Construction Impacts

Potential environmental impacts at the power plant site appear to be few. The project area is primarily the peninsula of land on which the existing Bay Front plant sits north of USH 2. Along the western edge of the city of Ashland, the highway runs near the upper bluff line of a 16-foot bluff separating the city and Lake Superior below. The project site is a brownfield site that is home to the existing Bay Front boilers, and fuel storage and associated facilities. Two types of coal, wood chips, and chipped tires are all stored in small amounts on the property and moved with front-end loaders. The footprint of the existing power plant would not need to be expanded to accommodate the new power plant facilities. See Attachments C and D.

Much of the proposed construction work would be done on the inside of the existing power plant. The gasifier would be located at the current site of the plant's welding and maintenance shops, which would be relocated immediately north of their current locations. All of this work would occur on the lake side of Boilers 1 and 2. See Attachments C and D. Staging for all construction activities is expected to be at the power plant site as well.

3.1.1. Protected resources

Potential impacts on protected resources are not expected as a direct result of construction. There are no wetlands on the project site, and no natural plant communities or wildlife species in the area would be adversely affected. Three protected plant species have been identified in the township, but their natural habitats are forests, cold brooks, and springs. Because the power plant site has been completely disturbed, these habitats do not exist on the property. A protected predaceous diving beetle has been identified in a nearby creek, but it likely would not be affected by either construction or operation of the power plant. Two archeological sites have been identified in the inventory of the Wisconsin Historical Society, but both are shipwrecks, neither in an area close to planned plant construction or operation activities.

3.1.2. Noise and visual impact

Noise does not appear to be an issue. The existing plant is located at the northwestern edge of the city of Ashland across USH 2. There would be an increase in road traffic with deliveries for construction, but traffic levels and patterns are not expected to change noticeably at the power plant site because of construction. The noise from diesel powered construction equipment would also be distant and below the elevation of the rest of the city and should not be a dominant interference in the activities of residents or businesses.

Construction activities would involve demolishing the welding structure, grading land, and erecting the gasifier facility and biomass handling facility. These would not be expected to create any more of a chaotic or industrial appearance than the industrial activities already occurring at the plant site. Most of the gasifier construction work would occur within a building structure, which would dampen the construction noise.

3.1.3. Rate effects

With the new facility entered into NSPW's capital inventory, there would be a rate impact on NSPW customers but it would be less than the rate impact associated with construction of an entire new power plant. The company has indicated that the cost of continuing to burn the coal in Boiler 5 would increase greatly because of emission requirements of new CAIR and Wisconsin Hg rule requirements. The proposed project and alternatives have been offered to avoid those increased costs, which would be passed on to the ratepayers.

3.1.4. Traffic and dust

Potential impacts on the local environment and community from construction of the proposed project would appear to be mainly increased truck traffic and some noticeable noise and dust. Both the noise and the dust effects would be ameliorated by the existing berms and tree plantings to the east and the bluff to the south. The increased truck traffic would likely not be noticeable on USH 2 and other transportation routes, except for very large equipment shipments.

3.2 Potential Operating Impacts

This section discusses the impacts of operating Bay Front with the proposed plant modifications in place; it does not address the potential impacts of acquiring the biomass fuel. Those potential impacts are considered and evaluated in Section 3.3.

There would be few local, adverse impacts expected from operating the new gasifier and modified Boiler 5. The new facilities would be located on the Bay Front property and integrated with the existing Bay Front generation facilities. They would be compatible with the existing land use and would not change local agriculture, recreation, development plans, aesthetics, lighting impacts, odors, or other land uses in the immediate area. There would be no electric transmission facility changes needed, and the current system reliability would be maintained.

3.2.1. Local truck traffic

Because the amount of biomass used would double with the conversion of Boiler 5, an increase in biomass delivery traffic would occur. After taking into account the decrease in trucks delivering coal, it is estimated that an additional 25 to 40 trucks per day would be expected to deliver fuel to the site. The trucks would likely travel to the general area on USH 2, USH 63, or State Highway (STH) 13. They would enter the site off of USH 2/13 at one of the two plant entrances at lakeside. At this time, trucks use only the western entrance to bring biomass and chipped tires. See Attachment D showing the entrances to the plant. Attachment C shows how the existing entranceway would be adapted for both biomass delivery areas. The small public park associated with the eastern entranceway would not be adversely affected. Occasional traffic impacts and additional wear and tear on streets could be expected in the city over time, but those streets are already used by a variety of trucks so the effects may be noticeable but would not create a hazard.

There would be solid waste, particularly ash, generated by the gasifier, but it is not expected to increase traffic notably over present conditions. A vitreous solid waste generated by burning coal in Boiler 5 is currently trucked off-site. Boiler 5 would be converted to burn gas. Solid waste from filtration of lake water would likely be similar in quantity and content to that filtered from the lake water now for Boiler 5.

No rail impacts would be expected because the rail line spur to the plant was removed some time ago and replaced in part with a bicycle/pedestrian path.

During the hearing, one member of the public commented that transport of biomass from 50 to 100 miles away represents too little efficiency when using this resource for electricity.¹⁴ The witness argued that a better use of the forest resource would be targeted, on-site production of biomass energy at industrial and institutional locations utilizing locally-sourced biomass. Such a system would make use of more efficient, cogeneration systems and reduce efficiency losses related to energy output and transportation.

3.2.2. Dust and other air emissions

Associated with biomass deliveries would be the potential for fugitive dust impacts. However, the number of coal deliveries with their own associated dust issues would decrease. At the present time, berms with tree plantings have been installed to reduce fugitive dust from the existing coal piles that could affect the nearby marina to the east. There are also existing coal piles on a dock, composed of fill material, to the east between the plant and the marina. Some of the coal in those piles is used at Bay Front. It is brought to that point by barge and trucked to the plant *via* USH 2 as needed. With the gasifier, less coal would be needed so the additional storage area might be discontinued after the coal occupying the area is used. Thus, the number of trucks making the short trip to the Bay Front plant from the coal dock would decrease, eventually to zero.

¹⁴ PSC Reference #111879.

The biomass used in Boiler 5 must be chipped and ground to a uniform size (about 1 1/2 by 2 by 1/4 inches) for efficient gasifier operation. This would not be done on site. Stored biomass for the gasifier would be piled in an area replacing some of the existing coal pile. Dust would occasionally result from the “fines” but would be mostly blocked by the berms, tree plantings, and distance to the bluff. The trucks bringing the biomass appear to be mostly covered tractor trailers. Dust could also be released or present around the truck trailer dumping equipment. Fugitive dust prevention generally involves covers over conveying equipment to inhibit smaller particles from blowing away.

Air pollutant emissions would result from the operation of the fuel delivery trucks, gasification of the biomass, and combustion of the gas. There also would be more trucks emitting diesel combustion byproducts, including CO₂.

Although no air permit has been issued or applied for, the emissions of criteria pollutants from the plant are all expected to decrease below the levels currently emitted from the combustion of coal. As the boiler fuel is shifted from coal to gasified wood, a decrease of 60 to 80 percent is expected for NO_x, particulate matter (PM), sulfur dioxide (SO₂), and Hg. Particulate matter 10 to 2.5 micrometers in diameter (PM₁₀) and particulate matter less than 2.5 micrometers in diameter (PM_{2.5}) are expected to decrease, as well as total PM. NSPW’s estimated current and expected pollutant emissions are shown in Table 1. DNR staff has indicated that, while no permit application has yet been filed, the operation would appear to be permissible without problems.

Table 1 Current air pollutant emission rates at Bay Front and expected rates if proposed modifications are approved

Pollutant	Current Boiler 5 Emission Rate (pounds per million Btu)	Expected Emission Rate with Gasifier	Percent (%) Reduction from Coal-fired Boiler
NO _x	0.80	< 0.30	>60 %
PM	0.60	< 0.10	>80 %
SO ₂	3.20	< 1.20	>60 %
Hg	0.000003572	<0.0000008	>80 %

CO emissions are expected to decrease as well, as a result of burning gas instead of solid coal. But, the company expects to be required by DNR to install a CO continuous monitor because there would be wood in the gasifier. There is already a continuous CO monitor installed near Boilers 1 and 2.

The output through the stack for Boiler 5 is currently at about 40 percent opacity. With the project modifications, the opacity would drop to less than 20 percent. This drop would represent about a 50 percent decrease in opacity from the current situation.

According to the company, CO₂ emission levels related to the combustion of biomass going in to Boiler 5 are expected to drop from current levels to a net level of zero because the fuel would be residual tree materials that can be regenerated, as opposed to fossil fuels. The company believes that forest regeneration (or dedicated plantations) in the biomass source areas should eventually

sequester the same amount of CO₂ emitted by the proposed project and, relative to the consumption of coal or natural gas, this process represents a conceptual “closed loop” life cycle for the pollutant. However, the amount sequestered by the regenerating forest or new plantations would depend on the health of the source forest or plantation areas and the effort made to ensure that the amount sequestered would be equivalent in carbon content to the amount consumed at the plant.

Several factors could affect the relative levels of CO₂, including the carbon content of the tree material being consumed in contrast to the carbon content of the trees grown for regeneration. If more whole trees were chipped and gasified at Bay Front, for example, the regenerating forest would need to grow to the maturity level of those harvested whole trees in order for the system to approach a carbon neutral state. If the biomass gasified at Bay Front were entirely harvest residue, the regenerating forest would sequester as much carbon in less time. Regeneration of the woodland harvested as whole trees for other industries, like wood products or paper-making industries, would represent a different CO₂ sequestration life cycle.¹⁵

When the entire carbon cycle is examined, additional CO₂ emissions during harvest, transport, and handling are considered. There also would be some CO₂ production from machinery operation related to the boiler and fuel handling. Research available indicates that precise estimates of CO₂ emission can be made but the accuracy of estimates suffers from the uncertainties related to the type and care of the different pieces of equipment used, the types of landscapes harvested, and the distance from each biomass source to the power plant.

A reasonable estimate can be made of the difference in scale between the logging and hauling emissions and the emissions from combustion of the coal that would be replaced.¹⁶ Total annual CO₂ emissions from all logging in five Wisconsin counties around the Bay Front plant is approximately 500 tons, and emissions from trucks transporting the biomass to the plant from 75 miles away would be about 2,400 tons. The residue from logging that would not be harvested for the gasifier would degrade over time, releasing CO₂ and methane, and would not provide any electricity. If residue and mill wastes satisfy the biomass needs of the company and are the fuels used in the gasifier, then the carbon life cycle biomass emissions can be assumed to be close to zero compared to approximately 195,000 tons of CO₂ per year emitted from Bay Front’s Boiler 5 when it burns coal and petroleum coke.

3.2.3. Water quantity and quality

Water quantity and quality in Lake Superior would be affected very little by the new facilities. Bay Front utilizes a once-through cooling system, and this system would continue to serve the modified plant. The water in the lake at the southeastern corner of the property would continue to be warmed by cooling water that has passed through the condensers to cool the steam from the

¹⁵ Testimony by Commission staff witness Dennis Koepke discusses this point briefly in his rebuttal testimony and cites the report by the Winrock Foundation for the Wisconsin Governor’s Task Force on Global Warming that showed that sustainable timber harvest could be net carbon neutral. PSC Reference # 119012.

¹⁶ Provided by Mr. Koepke in his testimony in PSC Reference # 119012.

three boilers. The gasifier would not add to the cooling water quantity or change the cooling water quality.

Erosion and stormwater runoff would be controlled, under DNR permit, so that quality of the immediate vicinity of Lake Superior water would not be affected. At present, after rains the runoff water from the coal and biomass piles puddles on the property and then evaporates or percolates into the fill.

There would be no large-scale evaporative loss from cooling towers. Some water would be lost to the atmosphere or the lake through a variety of lesser avenues, but there would likely be no more lost than under the current Boiler 5 operating situation. Because there are no cooling towers involved, there would also be no potential for fog or ice deposition on USH 2 or anywhere else off-site resulting from power plant operations.

3.2.4. Potential community impacts

3.2.4.1. Local economy

There would be an increase in shared revenue for the city of Ashland and for Ashland County under the shared revenue utility aid formula. A recalculation of shared revenue would be based on about \$2,000 per MW of name plate capacity, with two-thirds going to the city and one-third to the county. The payments could include incentive payment adders:

- \$600 per MW because the new plant would be built on the site of an existing power plant;
- \$600 per MW because the plant is over 50 MW and is a baseload facility with a capacity factor greater than 60 percent;
- \$1,000 per MW because the plant would derive energy from an alternative energy source.

Annual shared revenue payments at 60 MW of capacity could be about \$212,000 for the city of Ashland and about \$172,000 for Ashland County if the above adders all apply. NSPW states that these payments would be an increase over current shared revenue payments for the two municipalities. At the very least, they would not represent a decrease in revenue for those municipalities.

Secondary economic impacts of the new unit appear to be generally minor and positive in the Ashland area. Bay Front employs 35 people full time, and this number would likely not change notably. Construction would require additional personnel, who could come from the region. Representatives of Ashland area offices, organizations, and trade unions all testified in support of the project.¹⁷

¹⁷ In PSC Reference # 118676.

3.2.4.2. Municipal services

Because the proposed project involves an existing operating power plant, the effects on the local community, beyond the additional temporary jobs and revenue, would not be very different than the impacts of the existing plant. There would be no need for additional police, fire, or emergency medical support from the community. According to the Bay Front plant manager, a recent coal pile fire at the plant brought the local fire department to the site but only to supply some equipment that the plant could borrow. The department personnel stayed on-site to learn more about how to handle such fires.

The additional shipping trucks would represent additional street traffic, potentially more road maintenance, and also additional people who might purchase goods or services.

3.2.4.3. Vulnerable communities

Within a community, daycare facilities, schools, hospitals, and elderly care facilities would normally be affected by air emissions, fugitive dust, increased noise, increased traffic, or concerns about electric and magnetic fields. Within a mile of the Bay Front plant, there are two schools, one identified daycare facility, one hospital, and two elder care facilities. These institutions have been operating at their current locations while the existing Bay Front plant has been in operation, including Boiler 5. Some are located on USH 2 and may experience more truck traffic on the street, but none are likely to experience new plant noise, air emissions, dust, or changes in existing magnetic field levels.

3.2.4.4. Views and aesthetics

The view of the plant would be changed little overall. The welding and maintenance shops are located just behind Boilers 1 and 2 and would be relocated slightly to the north, closer to the existing coal conveyors. The gasifier would be installed in their place north of (behind) the boilers. The new facilities would be similar in size to the existing boiler buildings. The entire power plant site is below the elevation of the city south of USH 2 but easily visible from the east and west along the lake. However, compared to the size and colors of the existing equipment, visual impacts to lake, marina, and lakeshore path users are expected to be minimal. Currently, marina and lakeshore path users see the existing plant (and the coal piles) to the west and the well-known, abandoned ore dock to the east. The new biomass unloading and handling facilities would be on the east side of the property near lake level opposite the existing biomass unloading and handling facilities for Boilers 1 and 2. They would be visible but similar to what is currently present.

3.2.4.5. Noise

NSPW does not anticipate significant changes to the existing noise regime from operation of the gasifier. It would be encased in a building that should have some sound attenuation measures incorporated. No air separation units appear to be expected. There would, however, be additional truck noise from the increased biomass deliveries to the plant, although less coal would be delivered.

3.2.4.6. Recreation

Any lake or land recreation activities in the vicinity of the plant would likely continue without additional impact, although the lakeshore path might be disrupted at times to accommodate the additional biomass deliveries.

3.3 Potential Impacts of Acquiring Biomass

Potential impacts from acquisition of the biomass fuel would include the effects on the forest and communities of removing the biomass, operating harvest equipment in the woods, and air emissions and highway wear and tear from truck transport of the fuel from the sources to Bay Front. Many of the potential effects, such as air and noise impacts from the harvest equipment, would be similar to the effects of the timber and pulp wood harvesting that occurs in the local woodlands currently, particularly because the harvested biomass would primarily be residues from existing logging activities.

The main concerns about biomass acquisition itself relate to: (1) whether the harvest activities and the types and amounts of residue left behind in the woodland are appropriate to sustain the forest soils, future woodlands and plant and animal habitat; and (2) the potential for harvested areas or dedicated biomass plantation systems to affect regional communities or the regional ecological landscape mosaic. There are fewer environmental concerns about the acquisition of wood mill wastes.

There has also been concern expressed about the parts of the trees that would be harvested and utilized, the types of residues utilized for biomass energy and their other useful purposes in the forest, and the potential species that might be included in the fuel mix. In terms of tree parts, NSPW has indicated that it would utilize not only woody residues but also whole trees if the price was low enough because of reduced demand for pulpwood. The company says that using chipped whole trees would also help bolster the logging industry and keep loggers and the logging system functioning when demand for lumber and pulp was so low that loggers might go out of business. However, if the company were to harvest tree boles (roundwood) to gasify, the CO₂ emitted during gasification and combustion at Bay Front would take much longer to be resequenced as new forest growth.

In terms of types of residue, NSPW has indicated that it would take dead trees or snags and other less marketable types of residue. Dead trees, though, are important wildlife habitat features, and their removal may not be appropriate at many sites. With respect to potential species, NSPW has suggested that it would harvest “underutilized” species like hemlock, tamarack, or cedar. There are some substantial concerns about this practice. Because tamarack and cedar occur on permanently saturated wetlands, they would be difficult to harvest sustainably under current Wisconsin Best Management Practices (BMP) and our increasingly warm winters. Cedar and hemlock also have value in creating wildlife habitat and aiding in forest regeneration and are restricted in harvest on state and federal lands and Indian Reservations.¹⁸

¹⁸ Direct testimony of Professor David J. Mladenoff, PSC Reference #116944, p. 216.

If the project is approved, it might be appropriate to include a condition that the company track and identify the types of fuels purchased and utilized and provide this information in annual reports to the Commission. It might also be appropriate for the Commission to create a regular fuel plan approval process that would be helpful in maintaining and sustaining Wisconsin's homegrown biomass fuel supply.

3.3.1. Sustainability of woodlands

The concern related to sustainability of the woodlands that are sources of the biomass fuel is that harvest activities in the woods must not damage the soils so that they are incapable of regenerating a forest community that can support the natural array of wildlife typically adapted to woodland habitat, and can sequester the maximum amount of carbon to maintain the "neutral" status of biomass as a greenhouse gas emitter.

In addition to the appropriate operation of harvest equipment, concerns include the types and amounts of woodland residue left behind after harvest. Concerns about residue are addressed primarily by the Guidelines developed by the Wisconsin Council on Forestry and proposed to be implemented by DNR. In Wisconsin, the Guidelines are few in number and are meant to be implemented in addition to any applicable "silvicultural guidelines," "forest management guidelines," and BMPs. They are weaker than guidelines or standards in place elsewhere. For instance, lesser amounts of fine woody debris are recommended to be left behind than in Michigan, Minnesota, Missouri, or Pennsylvania.¹⁹ However, DNR has accepted the Guidelines and the responsibility to implement them. Because they are new and untested, it may not be appropriate for the Commission to challenge them or require stricter measures for this project or at this time. Conversely, it may be appropriate to investigate whether these Guidelines for the harvest of woody residual materials are ecologically adequate. Such research would require funding. If it is shown that the Guidelines could be improved, the state could pursue the improvements. NSPW has indicated a willingness to abide by the Guidelines if they evolved.

The Guidelines describe how coarse woody debris, fine woody debris, forest litter, stumps, and root systems should be handled when harvesting woody biomass. They also include specific approaches to more vulnerable situations such as: (1) the presence of species of greatest conservation need and sensitive ecosystems; (2) complete salvage operations following severe disturbances such as crown fires; (3) shallow soils within 20 inches of bedrock; (4) dry nutrient-poor sandy soils; and (5) wetland soils with at least 16 inches of organic material that are nutrient-poor with a low pH. While this document and other states' published woody harvest guidelines are not enforceable by law, NSPW would serve the sustainability of the woodlands better if it gave preference to those suppliers who agree to be contractually bound to observe them in Wisconsin, Minnesota, or Michigan.

¹⁹ Professor David J. Mladenoff direct testimony in transcripts for PSC docket 4220-CE-169, pp. 209-210. Professor Mladenoff has indicated that he was the only forest scientist on a committee of 15 individuals otherwise based in the forestry and logging industries, federal agencies, a conservation organization, DNR, and one Indian Tribal unit.

NSPW intends to use a third party contracting system for biomass supply. The company has indicated that it would retain the ability in its contracts to show preference to those suppliers that obtain biomass fuel in a sustainable way. The contract would allow the company to suspend or cancel the agreement if the supplier does not adhere “to applicable biomass harvesting guidelines” or does not comply “with applicable managed forest plans or laws” of the state where harvesting is occurring. Such a contract could also include specific references to water quality protection, prevention of soil erosion, prevention of disease spread, protection of historic and cultural resources, and related environmental values. Short of requiring appropriate records and employing inspectors and affidavits to verify that sustainable methods particular to each harvest site are used, enforcement of basic sustainability principles through contracts may be the best method for reducing impacts while acquiring biomass from woodland harvest residues.

3.3.2. Historic properties

Two Ojibwa bands have written to Commission staff in response to Wisconsin Environmental Policy Act (WEPA) scoping, concerning the acquisition of biomass fuel and its potential for adverse impact to historic and cultural resources. They indicate that, where federal or state agency interests are involved in biomass harvest, the agencies must comply with Section 106 of the National Historic Preservation Act in notifying the tribes and the State Historic Preservation Officer in the appropriate state, and in performing required archeological investigations. They also indicate that many prehistoric sites and Indian historic sites are not yet identified or documented, and that there are places in the northern woodlands that are significant because of natural features and not necessarily because of man-made features. Their interest underlines the importance for federal and state agencies to comply with federal and state preservation laws when biomass harvest is occurring under state or federal jurisdiction, and it can serve as a reminder to private landowners and harvesters who would log lands of historic importance.

3.3.3. Landscape mosaic

Preserving the landscape mosaic is an issue that addresses biological, agricultural, and social concerns. It relates to dedicated fuel crop plantations as well as forest residue harvesting.

To avoid harvesting trees from the woods primarily for biomass, dedicated plantations might need to be developed. In Advance Plan 7,²⁰ DNR and PSC staff recommended that fuels be sought in the following priority order:

- a. Wood industry residues;
- b. Urban, forest, and agricultural residues (with appropriate residue left in forest or field);
- c. Wood or herbaceous energy crops (grown in harmony with sustainable farming practices and the existing local natural landscape); and
- d. Harvest of natural woodlands, as a last resort.

²⁰ PSC docket 5-EP-7.

These recommendations still make sense. Forest residues should be used only if the appropriate amounts and type of residue are left behind to sustain the soils and plant communities. If the Guidelines are not strong enough to ensure that this occurs, the Guidelines should be strengthened. If the supply of mill wastes and woodland residues after logging in compliance with appropriate harvest guidelines is not sufficient to fuel the boilers at Bay Front, farmland-grown dedicated fuel crops likely would be a more environmentally sound choice than relying on whole trees from existing forests. Creating fuel crop plantations out of existing natural woodlands is also not an ecologically sound practice.

The placement and size of such plantations could have lasting and far-ranging effects on regional ecosystems and landscapes unless integrated with landscape scale biological, agricultural, and social considerations. An adaptive resource management approach would be useful, applied in phases of development that would incorporate increasingly larger or more biomass plantations. Again, research proceeding along with the development of such plantations would establish regulatory feedback loops for improving plantation design, placement or operation.

Compatibility with existing land uses, recreational impacts, and property values is the concern of woodland owners who sell biomass. A study of how the harvest affects local surrounding land uses, recreation, or property values could be part of an adaptive approach to fuel supply.

4.0 Evaluation of Reasonable Alternatives and Some of their Economic and Environmental Consequences

4.1 No Action Alternative

The no-build alternative would require NSPW to continue to burn coal in Boiler 5 and install equipment to comply with CAIR and recently adopted Hg regulations, or to retire Boiler 5. If the unit was retired, the company would need to develop a new generation option, such as natural gas-fired generation, or purchase its energy either on the open market or from dedicated wind farms in Wisconsin or other states.

NSPW states that it cannot continue to rely on coal for Boiler 5 because the costs of environmental compliance related to controlling air pollutant emissions are projected to be prohibitive. Under CAIR, NSPW projects the need to purchase more NO_x allowances. Under Wis. Admin. Code ch. NR 446, additional funds would be required to install BACT for Hg by January 2015. Likely Hg controls required under BACT would be activated carbon injection and a baghouse to capture the carbon before it goes up the stack. Therefore, if Boiler 5 is not modified to accept another fuel besides coal, retirement in 2015 is likely, if not guaranteed.

4.2 Other Alternatives Evaluated by NSPW

For its CA application, NSPW provided evaluations of five alternatives to the proposed project. The company evaluated the proposed project and these alternatives using the resource planning model Strategist. The five alternatives are discussed in some detail in the application, and are summarized briefly below.

4.2.1. Market purchase option

This option is essentially the no action alternative. It involves continuing to burn coal in Boiler 5 until it is retired in 2015 and replaced with market purchases. It is a low-cost alternative but would put the company at the mercy of the market when Boiler 5 is retired. Before retirement, the boiler would continue to need specialized coal to minimize slagging, and NSPW would also have to continue to pay extra to have that coal transported by multiple means to the plant on the shore of Lake Superior. This alternative would contribute nothing toward meeting NSPW's RPS compliance and it would eventually eliminate jobs in northern Wisconsin. Relying on the market could increase the costs of electricity and result in less consideration of greenhouse gases when making market purchases.

4.2.2. Natural gas conversion option

This option would involve continuing to burn coal in Boiler 5 until 2015 and then switching to burning natural gas in Boiler 5 for the remaining life of the boiler. Natural gas would be more expensive to use so Boiler 5 would be dispatched for peak need only. This option would preserve the boiler's accredited reserve margin capacity and help NSPW's system meet its Midwest Independent Transmission System Operator Inc. (MISO) and PSC reserve margin requirements with a relatively small capital expense. NSPW prefers this option if renewable energy is not pursued.

While reducing the emissions of criteria pollutants and greenhouse gases to some extent, these impacts would be lessened or avoided if a renewable energy source was utilized.

4.2.3. Wisconsin wind option

This option would involve retiring Boiler 5 in 2015 and replacing it with comparable wind capacity from within Wisconsin. This option has the second highest capital cost, due to the need to build new wind turbines and account for wind power's reduced capacity factor. NSPW also cites projected higher operating costs to make sure reliability is maintained. This could include costs for additional generation, likely natural gas-fired generation, to provide the regulated spinning reserve. Although additional natural gas-fired generation would reduce greenhouse gas emissions to some extent compared to current emissions associated with burning coal, the larger potential reductions from operating the proposed biomass gasifier would be lost.

In compliance with MISO rules, a Wisconsin wind project would be accredited at only 9.7 percent of its nameplate capacity. It would not be compatible with the recommendation of the Governor's Task Force on Global Warming to develop baseload generation and it would not help diversify NSPW's renewable energy portfolio the way a biomass plant would. In addition, large-scale wind projects in Wisconsin are becoming more difficult to site due to the state's residential population density and concerns about noise, shadow flicker, and property value concerns.

4.2.4. Imported wind option

This option would involve retiring Boiler 5 in 2015 and replacing it with comparable wind capacity from Minnesota or the Dakotas. It also would have higher capital costs and would be problematic like the Wisconsin wind option, in that it would have higher operating costs, would not provide baseload support, would require natural gas backup, and would not diversify NSPW's renewables portfolio. Wind resources in the west generally have higher capacity factors, however, and the wind would be accredited at 12 percent of its nameplate capacity for MISO purposes, better than the Wisconsin wind alternative. Residential population densities in some areas of western Minnesota and the Dakotas are also lower. However, there would be additional transmission costs to bring that wind power to the customer area currently served by Bay Front.

4.2.5. Circulating fluidized bed (CFB) option

This option would involve replacing Boiler 5 with a boiler that would use CFB technology. The CFB could burn coal or biomass, or other solid fuels like petroleum coke. NSPW modeled this alternative assuming 100 percent biomass fuel, so it would be similar in its fuel supply sources and acquisition techniques. Its dispatch pattern would be more similar to that of the existing coal-fired boiler than wind energy, which is not dispatchable in the same way. However, installing CFB technology would have the highest capital cost of all since it would require completely replacing Boiler 5 with a new boiler. The proposed gasifier project offers similar benefits for a lower cost.

5.0 List of Persons Contacted and Summary of Comments or Other Information Received from Them

1. David Siebert and Benjamin Callan of DNR Office of Energy – information about permits that would be required for the project and DNR personnel with access to useful information about the use of northern Wisconsin wood resources.
2. Steven Dunn, DNR Air Management Bureau – information about potential air pollutant emissions and modification of the company's air permit.
3. Darrel Zastrow and Carol Nielsen, DNR Division of Forestry – information about existing wood resources and uses, questions about timing, transport, and storage of wood fuel, and information about northern Wisconsin woodland owners associations to aid in contact during scoping.
4. Jason Fischbach, Agricultural Extension Agent, Ashland and Bayfield County, UW Extension – information on potential biomass suppliers and guidelines.
5. David Fulweber, manager of the NSPW Bay Front Power Plant – information about the plant site, boilers, fuel supply and handling, and expected layout of the new project facilities.

6.0 WEPA Determination

As stated in the introduction to this EA, the decisions in this case would constitute a Type II action under Wis. Admin. Code § PSC 4.10(2).

Under Wis. Admin. Code § PSC 4.10(2), Table 2.bg, an EA is required for the review of a biomass or waste-to-energy electric generation facility project. The proposed project is a biomass generation facility project. Under Wis. Admin. Code § PSC 4.10(2), Table 2.d, an EA is required for the review of a project in which a generation facility's fuel type is to be changed. The proposed project would eliminate the coal and petroleum coke fuels for Boiler 5 and replace them with the syngas produced by a new biomass gasifier to be installed at the plant site.

The following considerations have been made in order to help determine if an EIS is necessary for the project review.

6.1 Effects on Geographically Important or Scarce Resources, such as Historic or Cultural Resources, Scenic or Recreational Resources, Prime Farmland, Threatened or Endangered Species, and Ecologically Important Areas

Construction of the new facilities would not have direct impacts on geographically important or scarce resources. The plant facilities would be built on the existing fill peninsula on the Lake Superior shore that supports the Bay Front Power Plant. The peninsula has protective berms and vegetation but no natural, non-human-made resources or conditions that would be affected.

With respect to operational impacts, there is a potential for adverse effects of biomass fuel acquisition on historic or cultural resources, scenic or recreational resources, protected species, or ecologically important areas. These effects could be avoided or reduced through appropriate contract language with suppliers, adherence to the established biomass harvesting guidelines in each state, and other conditions ordered by the Commission based on this EA or testimony in the hearing for this case.

The proposed project involves 20 to 28 MW of generation requiring an additional 200,000 to 250,000 green tons of biomass. NSPW has stated that it cannot predict the exact source areas from which the fuel would be harvested; however, much of it would come from Wisconsin lands that would be within 100 miles of Ashland, Wisconsin.

Edaphic, hydrologic, and other ecological conditions in the biomass source areas must be considered in order to follow the appropriate ecological guidelines and maintain forest sustainability. Several parties to the case have stated that a detailed evaluation of the types and amounts of forest residues that would be utilized at Bay Front and the impact of this use is still needed. Commission staff cannot complete this analysis because there are too many uncertainties regarding these aspects of the proposed project. For example, the specific forest site characteristics where residues would be harvested and the methods and extent to which sustainable harvest practices would be enforced are unknown. Also, the efficacy of Wisconsin's new Guidelines has not been tested or demonstrated.

Because NSPW currently obtains mill waste and harvest residues for Boilers 1 and 2 mostly from within 100 miles of Bay Front without causing serious ecological impacts, it believes that the additional woody biomass needed for Boiler 5 is also available and that its acquisition could occur in a similar manner. However, data showing some of the soils and hydrological characteristics of forests within a 50- and 100-mile radius of the Bay Front plant was provided by

a Clean Wisconsin witness. Based on this data, it appears that the areas available for harvest of woody residues could be somewhat limited in Wisconsin if NSPW's biomass suppliers adhere to the Guidelines and that the potential for impacting sensitive resources exists.

Although NSPW's application materials lack specific information about harvest sites and the types of woody residues that would be utilized, the Commission's implementation of some monitoring and tracking requirements along with some long-term research and ongoing management of fuel procurement could minimize the potential for major environmental and social impacts for this project and future biomass energy projects that are being planned.

If the Commission approves this proposed project, some conditions of construction, operation, and research needs would substantially mitigate the potential for serious long-term impacts on the forests of northern Wisconsin. The impact mitigation measures or information needs that have been discussed in this EA and raised at the hearing include:

1. Compliance with the 2008 Forestland Woody Biomass Harvesting Guidelines.

Compliance with the Guidelines is critical for avoiding major impacts on northern forest communities and sensitive resources because many of the soils present in the region designated for harvest by NSPW contain dry nutrient-poor sandy soils and dysic histosols that could sustain serious damage over the long term if not protected to some extent.

2. Tracking sites where woody residues or roundwood are obtained and providing periodic biomass fuel reports to the Commission and DNR.

This measure is crucial to enable post-harvest monitoring to determine compliance with the Guidelines, check for adverse effects on sensitive resources in the harvest area and monitor site recovery and regeneration rates. Periodic monitoring of some sites is needed to determine whether the Guidelines are sufficient or need to be improved upon, as the utilization of woody residues increases statewide.

3. Tracking and reporting the percentages of various biomass fuel components (*i.e.* boles, woody residues, mill waste, and plantation-grown fuel) utilized at the plant as part of an annual fuel procurement plan that would be reviewed by the Commission.

Tracking and reporting the percentages of various biomass fuels used and their relative costs would provide the Commission with a better understanding of fuel availability and general operating costs and trends. This information could be useful in the review of future biomass energy applications. Also, utilization of an increasing percentage of roundwood (compared to mill waste or harvest residues) could indicate that the CO₂ reduction benefits generally assumed for use of woody biomass may be overstated, and could have long-term implications for NSPW's RPS compliance.²¹

²¹ The combined measures discussed above in measures 1, 2, and 3 incorporate the ideas raised in testimony by the Wisconsin Paper Council that NSPW participate in an independent fuel supply verification program (similar to existing organic certification programs) that facilitates the tracking and analysis of the fuel supply and fuel supply impacts.

4. Prohibiting the forest harvesting of one or more categories of potential fuels.

Specific species such as hemlock, cedar, and tamarack, as discussed in the record for this docket, might be prohibited from harvest because of their habitat value and rarity. In addition, harvesting dead standing trees or certain portions of live trees might need to be limited to protect habitat value.

In addition, locations could be placed off limits or in need of special consideration if they include archeological resources or sacred places listed with the Wisconsin Historical Society or Tribal Historic Preservation Officers.

5. Limiting locations for plantations to already existing or abandoned farmland or urban land and prohibiting their establishment in existing natural woodlands.

Because a primary purpose of developing plantations is to eventually supplant extensive harvesting of natural forest residues to preserve the sustainability of natural forests and maintain the biological diversity of the landscape, plantations should not be created out of existing forest land.

To avoid or minimize long-term major impacts on area forests, if this project is approved, NSPW should be required to work with local agents to develop plantations within the supply radius of the plant on existing farmland (but not prime farmland). These plantations must be developed considering the potential impacts on local natural and community landscape features.

6. Utilizing woody biomass sources according to the Advance Plan 7 priority order recommendations.

These recommendations would restrain NSPW from using roundwood (tree boles) from a harvest operation for gasification at Bay Front, except as a last resort. This limitation would minimize the time needed to sequester the amount of CO₂ emitted by Boiler 5 and be consistent with sustainable forest biomass energy policy.

7. Supporting research to test or demonstrate the efficacy of the 2008 Forestland Woody Biomass Harvesting Guidelines.

Because the Guidelines are new (and weaker in some respects than those in surrounding states) and the use of woody biomass residues appears to be growing, it is essential that the degree of compliance with the Guidelines by landowners and loggers be monitored and that the Guidelines sufficiency in protecting forest communities, wetlands and waterbodies from major long-term environmental impacts is tested.

Testimony at the project hearing described how the Guidelines could evolve. To help the decision-makers with the task of evaluating and adjusting the Guidelines, independent research on biomass harvest impacts would be needed. The research would need to be long-term but adaptive over shorter terms, with feedback loops between the researchers

and the decision-makers. The company could contribute funding or provide resources towards this research.

8. Supporting adaptive resource management processes for plantations through research designed to provide feedback loops for growers, land managers and local governments. Establishment of such research for plantations would enrich our body of knowledge about this technology and its potential impacts on landscape diversity.

The mitigation measures discussed in items 1 through 6, particularly items 1, 2, and 5, would substantially alleviate the potential for this proposed project to have significant effects on the quality of the human environment. In addition, the long-term adaptive research identified in items 7 and 8 would provide state agencies, local governments and land managers with the information to make good decisions going forward as the demand for woody biomass increases statewide.

6.2 Conflicts with Federal, State, or Local Plans or Policies

There are no known or expected conflicts with federal, state, or local plans or policies. The project appears to be compatible with the state RPS and the Energy Priorities Law, particularly if the objective is to retain the same capacity of dispatchable baseload generation.

Much of the land within the hauling radius of the plant is owned and managed by the U.S. Forest Service (USFS). USFS is currently examining revisions to its policies to allow certain amounts and types of residue to be harvested for biomass fuel.

6.3 Significant Controversy Associated with the Proposed Action

There is some controversy associated with the proposed action. Five intervening organizations provided testimony representing a variety of viewpoints on the proposed project technology and prospective biomass fuel sources. CUB and Clean Wisconsin requested that the PSC prepare an EIS “to ensure that decisions regarding those actions are in the public interest” and because an EIS “requires and affords an opportunity for the agency and public to consider alternatives to the proposed action.”²²

Alternatively, few individuals or organizations within the project area have commented on the case. Little interest from members of the public was expressed during the scoping process or at the project hearing.

6.4 Irreversible Environmental Effects

There would be no notable irreversible environmental effects of construction and operation at the plant site, besides the use of building materials to construct the proposed gasifier and its housing,

²² Letter from CUB and Clean Wisconsin to Kathy Zuelsdorff, WEPA Coordinator for the PSC, June 30, 2009.

and the new biomass handling facilities. The effects of construction would be slight because of the industrial nature of the construction site.

The acquisition of the biomass fuel, if not done in compliance with the established Biomass Harvesting Guidelines in the surrounding states and PSC-ordered conditions for the project, could cause irreversible adverse effects on the long-term health of northern forests. Use of non-sustainable forest practices could result in the inability to regenerate forested communities or in long delays in the regeneration process, thereby affecting numerous ecological relationships, recreational opportunities, land use patterns, and property values. However, much of the forested land in the area is owned by USFS, DNR, or local governments. It is reasonable to expect that these entities, as well as private landowners, will manage their forests in a sustainable manner.

The establishment of biomass plantations would likely not create irreversible impacts, if they were created to blend with the surrounding natural, agricultural, and community landscapes, and not used as a reason to clear existing forest lands.

6.5 New Environmental Effects

If the biomass is acquired in a sustainable manner, there would be no identifiable new environmental effects. Activities associated with the proposed project would have impacts similar to those of past similar activities in the area, including the adverse impacts of short-term deforestation of some woodlands. If the biomass is not acquired in a sustainable manner, long-term deforestation could occur as described in the previous section.

A reduction in the emissions of a number of criteria air pollutants and greenhouse gases from the levels emitted from the combustion of coal or petroleum coke would be a positive environmental effect of this project.

6.6 Unavoidable Environmental Effects

The construction and installation of the new proposed gasifier and biomass unloading and handling facilities would create an unavoidable viewscape impact, but these impacts are not expected to be substantial. Likewise, the added traffic of more trucks to bring the biomass to the plant would be unavoidable, but the impacts of these vehicles would be similar to those of the trucks that currently supply the plant with coal, pet coke, and biomass fuels. Many other trucks already use the roads in the area for lumber and industrial purposes.

6.7 Precedent-setting Nature of the Proposed Action

The proposed gasifier project, which would create syngas from woody biomass, would be the first of its kind and scale in Wisconsin.

Initially, the fuel supply sources for Boiler 5 would be similar to those for existing Boilers 1 and 2. A precedent would be set if the fuel supply eventually was augmented by biomass from dedicated fuel crops. Development of dedicated plantations would be a pioneering effort and

could set a precedent on how such plantations are agronomically prepared for planting, how they are maintained, fertilized and protected from pests, and how the plantations are organized within the landscape.

CUB and Clean Wisconsin, in their request for preparation of an EIS, point out that the proposed project's environmental issues include "potential cumulative impacts as a template for future decision-making."²³ They conclude that the proposed project "likely will serve as a precedent for the procedures and environmental scrutiny that will be given to future biomass facility applications."²⁴ This could prove true as Wisconsin Electric Power Company is planning to apply for authority to build one or two new biomass-fired power plants in Wisconsin in 2010.

6.8. Cumulative Effect of the Proposed Action when Combined with Other Actions and the Cumulative Effect of Repeated Actions of the Type Proposed

There would be a cumulative effect on air emissions from the plant as coal and petroleum coke are replaced by biomass gasification and syngas and natural gas combustion in Boiler 5. This effect would be the further reduction in emission levels of criteria pollutants and greenhouse gases from those emitted when the boilers burned coal.

There may be some cumulative impacts related to the acquisition of the biomass supply for Boiler 5, as this would be in addition to the amount of biomass supplied for Boilers 1 and 2 from mills and forests. Additional harvesting of forest residue could increase the cumulative impact of logging and other forest activities by increasing site disturbance, decreasing soil fertility over time, and increasing vehicle emissions as additional equipment works to glean and transport the residue after the logging work is completed.

If the demand for woody biomass for energy purposes continues to grow, fuel prices could rise and some industries may be unable to compete for the available fuel. Over the long term, a depletion of forest resources in certain regions could occur if sustainable harvest practices are not utilized.

6.9. Foreclosure of Future Options

The Bay Front site would still be available for capital or technological modifications and adjustments in operating procedures. The source areas for biomass fuel would be expected, through appropriate contracting with NSPW, to be maintained in a sustainable manner so that they could continue to supply useful product to the utility or other consumers in future years. If NSPW determines that it cannot fuel Boiler 5 with syngas from the biomass gasifier because fuel is too difficult to obtain, it could use Boiler 5 to burn natural gas.

Within the forests, foreclosure of future options could result from forest mismanagement or excessive removal of residues for site conditions. If the woodland is no longer sustainable, it

²³ Letter from CUB and Clean Wisconsin to Kathy Zuelsdorff, WEPA Coordinator of PSC staff, June 30, 2009.

²⁴ *Ibid.*

would evolve to another vegetative community, possibly one much less productive with far fewer opportunities for wildlife.

6.10. Direct and Indirect Environmental Effects

There would be both direct and indirect environmental effects from this project. Directly, there would be new features at the plant site, more trucks entering and leaving the plant, less than 50 percent of the current opacity from the stack, and lower levels of criteria pollutants, Hg, and CO₂ emissions. There would also be less residue left on the forest floor at harvest sites to decompose and provide soil nutrients and less residue for other businesses to purchase and use at their own plants.

Indirectly, lower levels of greenhouse gases emitted into the atmosphere would lower the power plant's contributions to global climate change and its subsequent environmental ramifications.

While there are some uncertainties related to the potential impacts of harvesting woody residues and plantation development, the potential effects would likely be measureable and reduced or avoided through an adaptive resource management process involving monitoring, research, and regulatory feedback loops to the fuel supply process.

7.0 Recommendation

This EA concludes that construction and operation of NSPW's proposed project is unlikely to have a significant impact on the human environment if the practices and measures described in the company's application, in other submitted materials, and in this EA are implemented to adequately protect valuable and sensitive resources.

Because of the uncertainties inherent in this proposal (such as the precise locations of harvest sites, types and amounts of residues available, and the efficacy of the newly established Guidelines), an EIS likely would not include much new information or result in a different environmental evaluation of the project application. The information and research data necessary to determine the specific effects that removal of 200,000 to 250,000 tons of additional woody biomass would have on the Wisconsin landscape and how those effects could best be ameliorated is not currently available and cannot be generated within the time frame that an EIS for this docket might be prepared. Additionally, based on the very limited public interest in the project exhibited to date, additional opportunities for public comment seem unnecessary.

Commission staff has evaluated the information and facts presented in the application, subsequent submittals from all parties, and in testimony. The recommended mitigation measures and research needs identified in this EA are sufficient to avoid a significant impact on the human environment if the Commission approves this project. Therefore, preparation of an EIS is not required under Wis. Stat. § 1.11.

RECOMMENDATION:

 X No significant impact. Environmental review complete. Preparation of an environmental impact statement is not necessary.

 Prepare an environmental impact statement.

Submitted by: Kenneth C Rineer

Title: Environmental Analyst and Review Specialist

Date: September 21, 2009

This environmental assessment complies with Wis. Stat. § 1.11. and Wis. Admin. Code § PSC 4.20.

By: Kathleen J. Zuelsdorff
Kathleen J. Zuelsdorff, WEPA Coordinator

Date: September 22, 2009

KCR;jlt:L:\construction\construction generation\4220-CE-169\EA\EA 9-22-09.doc

Attachments

1,500 750 0 1,500 Feet

City of Ashland, Department of Planning & Development - 02/13/08
2006 Aerial Image

This map provides a representation of the geography and topology of tax parcels. It is not intended to be used for the legal determination of land ownership or to be in any way a substitute for the land ownership and interest description contained in individual deeds.

Legend



Parcel



Parcel within 1/2 mile

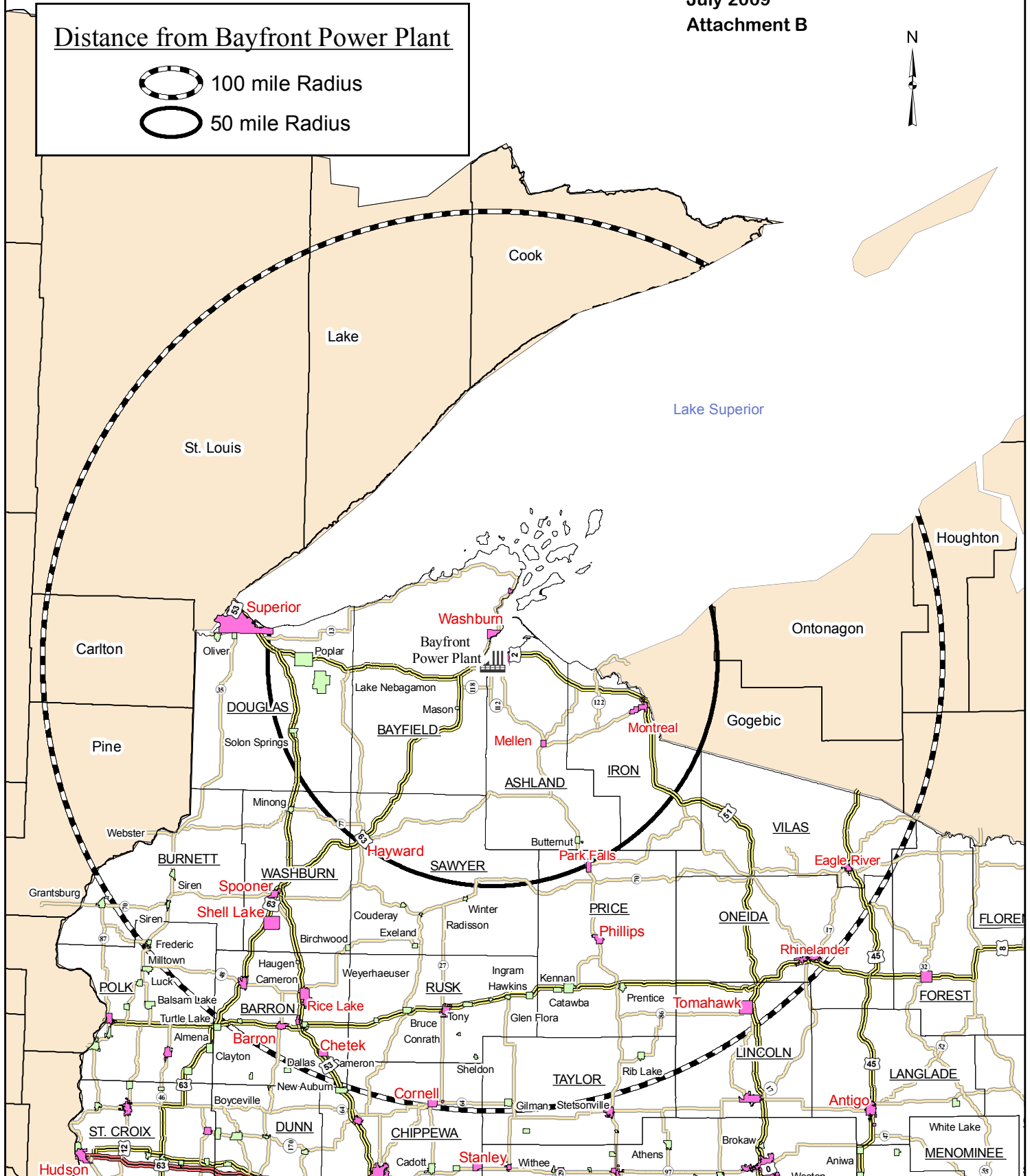
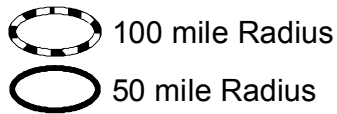
Bay Front plant

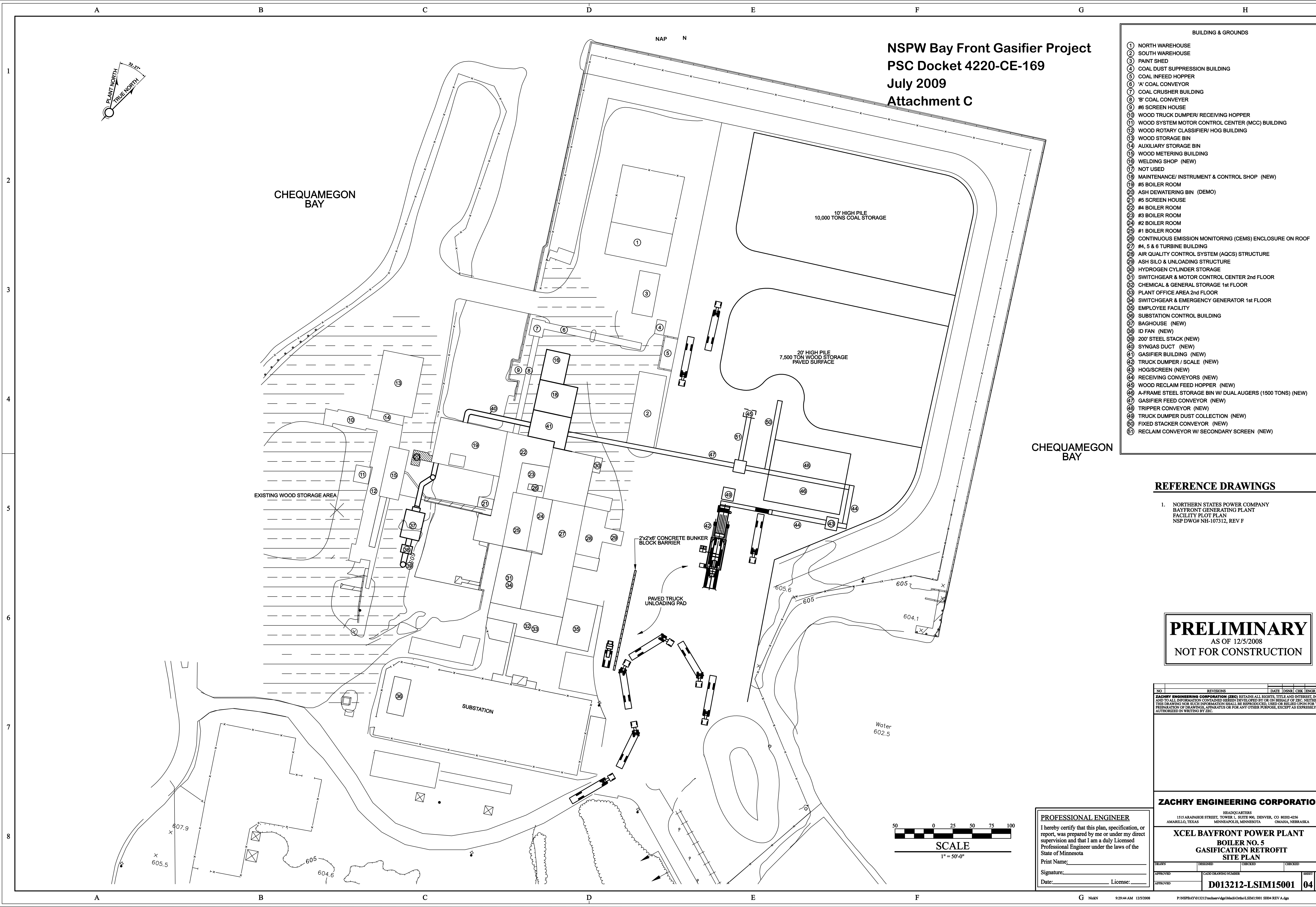


Wisconsin, Michigan, and Minnesota Counties within a 50 and 100 mile Radius of Ashland, Wisconsin

NSPW Bay Front Gasifier Project
PSC Docket 4220-CE-169
July 2009
Attachment B

Distance from Bayfront Power Plant





NSPW Bay Front Gasifier Project
PSC Docket 4220-CE-169
July 2009
Attachment C

- BUILDING & GROUNDS**
- 1 NORTH WAREHOUSE
 - 2 SOUTH WAREHOUSE
 - 3 PAINT SHED
 - 4 COAL DUST SUPPRESSION BUILDING
 - 5 COAL INFEED HOPPER
 - 6 'A' COAL CONVEYOR
 - 7 COAL CRUSHER BUILDING
 - 8 'B' COAL CONVEYER
 - 9 #6 SCREEN HOUSE
 - 10 WOOD TRUCK DUMPER/ RECEIVING HOPPER
 - 11 WOOD SYSTEM MOTOR CONTROL CENTER (MCC) BUILDING
 - 12 WOOD ROTARY CLASSIFIER/ HOG BUILDING
 - 13 WOOD STORAGE BIN
 - 14 AUXILIARY STORAGE BIN
 - 15 WOOD METERING BUILDING
 - 16 WELDING SHOP (NEW)
 - 17 NOT USED
 - 18 MAINTENANCE/ INSTRUMENT & CONTROL SHOP (NEW)
 - 19 #5 BOILER ROOM
 - 20 ASH DEWATERING BIN (DEMO)
 - 21 #5 SCREEN HOUSE
 - 22 #4 BOILER ROOM
 - 23 #3 BOILER ROOM
 - 24 #2 BOILER ROOM
 - 25 #1 BOILER ROOM
 - 26 CONTINUOUS EMISSION MONITORING (CEMS) ENCLOSURE ON ROOF
 - 27 #4, 5 & 6 TURBINE BUILDING
 - 28 AIR QUALITY CONTROL SYSTEM (AQCS) STRUCTURE
 - 29 ASH SILO & UNLOADING STRUCTURE
 - 30 HYDROGEN CYLINDER STORAGE
 - 31 SWITCHGEAR & MOTOR CONTROL CENTER 2nd FLOOR
 - 32 CHEMICAL & GENERAL STORAGE 1st FLOOR
 - 33 PLANT OFFICE AREA 2nd FLOOR
 - 34 SWITCHGEAR & EMERGENCY GENERATOR 1st FLOOR
 - 35 EMPLOYEE FACILITY
 - 36 SUBSTATION CONTROL BUILDING
 - 37 BAGHOUSE (NEW)
 - 38 ID FAN (NEW)
 - 39 200' STEEL STACK (NEW)
 - 40 SYNGAS DUCT (NEW)
 - 41 GASIFIER BUILDING (NEW)
 - 42 TRUCK DUMPER / SCALE (NEW)
 - 43 HOG/SCREEN (NEW)
 - 44 RECEIVING CONVEYORS (NEW)
 - 45 WOOD RECLAIM FEED HOPPER (NEW)
 - 46 A-FRAME STEEL STORAGE BIN W/ DUAL AUGERS (1500 TONS) (NEW)
 - 47 GASIFIER FEED CONVEYOR (NEW)
 - 48 TRIPPER CONVEYOR (NEW)
 - 49 TRUCK DUMPER DUST COLLECTION (NEW)
 - 50 FIXED STACKER CONVEYOR (NEW)
 - 51 RECLAIM CONVEYOR W/ SECONDARY SCREEN (NEW)

REFERENCE DRAWINGS

- NORTHERN STATES POWER COMPANY
BAYFRONT GENERATING PLANT
FACILITY PLOT PLAN
NSP DWG# NH-107312, REV F

PRELIMINARY
AS OF 12/5/2008
NOT FOR CONSTRUCTION

NO	REVISIONS	DATE	DSGN	CHK	ENGR	APPR
1	ZACHRY ENGINEERING CORPORATION (ZEC) RETAINS ALL RIGHTS, TITLE AND INTEREST, IN AND TO ALL INFORMATION CONTAINED HEREIN DEVELOPED BY OR ON BEHALF OF ZEC. NEITHER THIS DRAWING NOR SUCH INFORMATION SHALL BE REPRODUCED, USED OR RELIED UPON FOR THE PREPARATION OF DRAWINGS, APPARATUS OR FOR ANY OTHER PURPOSE, EXCEPT AS EXPRESSLY AUTHORIZED IN WRITING BY ZEC.					

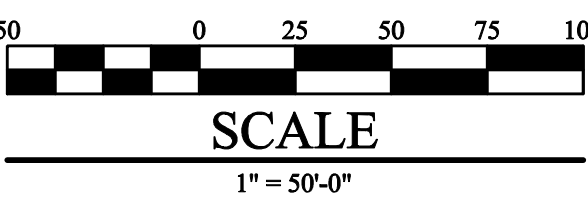
ZACHRY ENGINEERING CORPORATION

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AMARILLO, TEXAS MINNEAPOLIS, MINNESOTA OMAHA, NEBRASKA

XCEL BAYFRONT POWER PLANT
BOILER NO. 5
GASIFICATION RETROFIT
SITE PLAN

DRAWN	DESIGNED	CHECKED	APPROVED
APPROVED	CADD DRAWING NUMBER	SHEET	REV
APPROVED		D013212-LSIM15001	04 A

PROFESSIONAL ENGINEER
I hereby certify that this plan, specification, or report, was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota
Print Name: _____
Signature: _____
Date: _____ License: _____



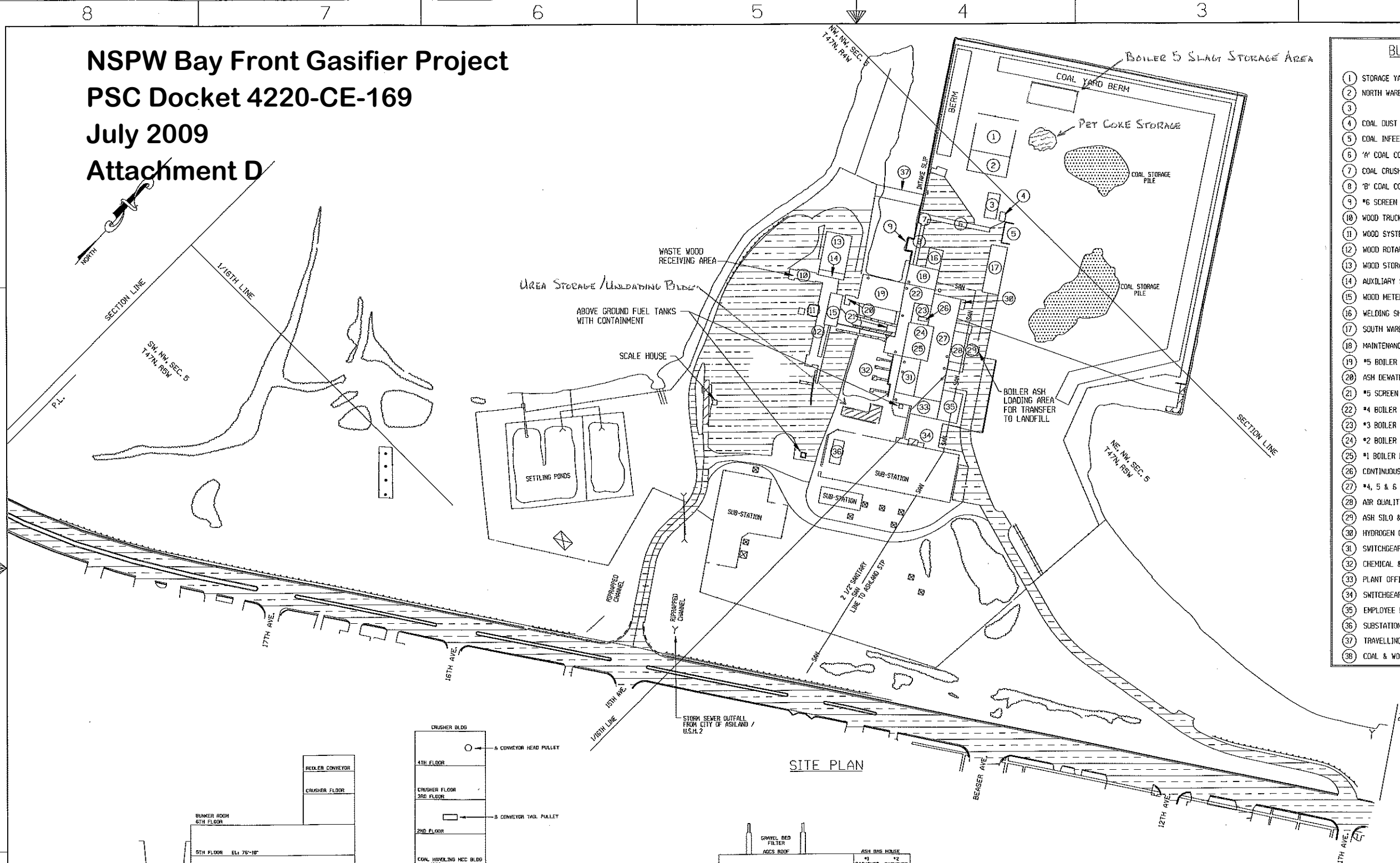
NSPW Bay Front Gasifier Project

PSC Docket 4220-CE-169

July 2009

Attachment D

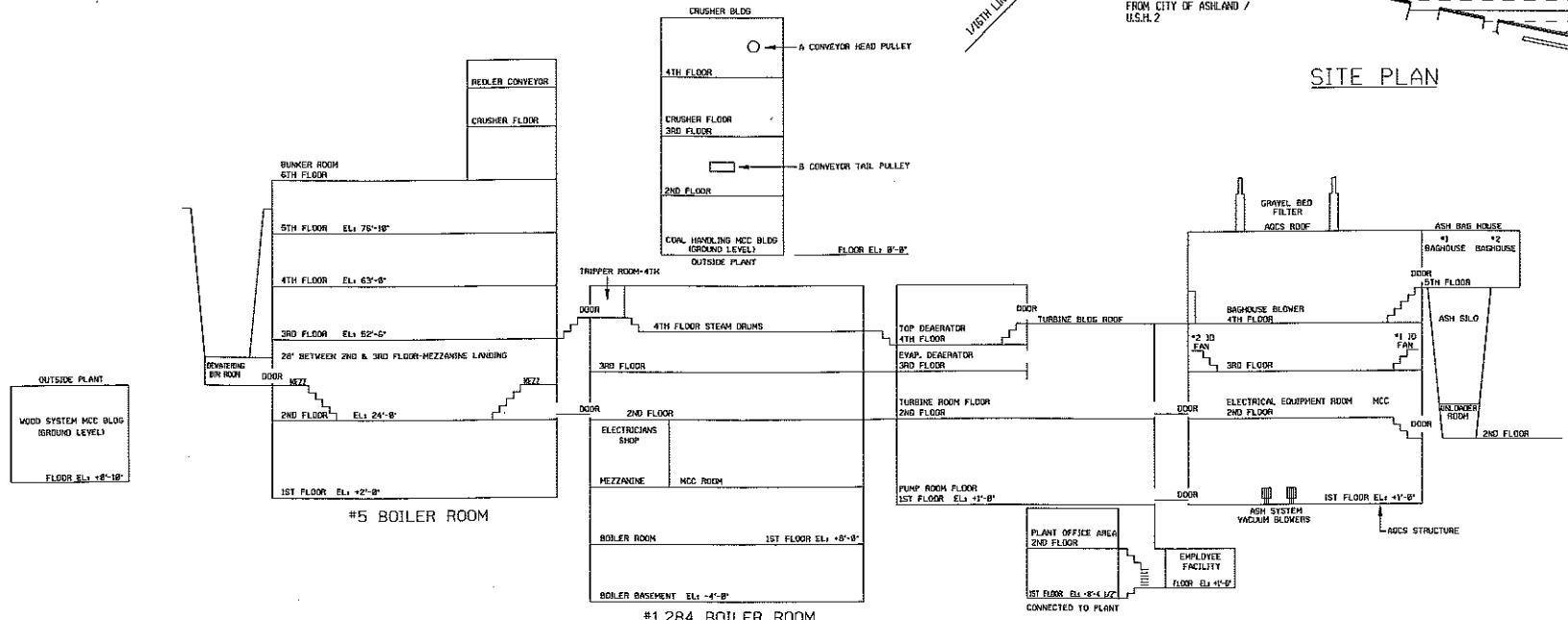
D
C
B
A



- #### BUILDING & GROUNDS
- 1 STORAGE YARD
 - 2 NORTH WAREHOUSE
 - 3
 - 4 COAL DUST SUPPRESSION BUILDING
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 - 35 EMPLOYEE FACILITY
 - 36 SUBSTATION CONTROL BUILDING
 - 37 TRAVELLING INTAKE SCREEN
 - 38 COAL & WOOD YARDS

REVISIONS	
A	AS BUILT- INCORPORATE THIS DWG. INTO THE NSP DWG. SYSTEM PER DWP: BF-99-4 DWN: MPP 8/25/99 CHK'D: JDS 2/00 PROJECT #: FILMED: 4/00
B	AS BUILT- REVISED SITE PLAN & BUILDING/ GROUNDS LIST PER DWP: BF-03-1 DWN: ACW 2/17/03 CHK'D: APT 6/6/05 PROJECT #: FILMED: 6/2005

D
C
B
A



PLANT FLOOR LEVELS

NOTE:
BAY FRONT PLANT ELEVATION 8'-0"
EQUALS USCS ELEVATION 625.434'

This map /document is a tool to assist employees in the performance of their jobs. Your personal safety is provided for by using safety practices, procedures and equipment as described in safety training programs, manuals and SPARs.

WILLIAMS ENGINEERING PROFESSIONAL ENGINEERS 2850 Metro Drive, Minneapolis, MN 55425 Telephone: (612) 854-6555 Fax: (612) 854-6972		TRACKING RECORD INITIAL / DATE	
		1 2 3 4 5 6	
NSP BAY FRONT BUILDINGS AND GROUNDS GENERATING PLANT		N.T.S. REV B NH-171110-53	
NORTHERN STATES POWER COMPANY ENGINEERING DEPARTMENT MINNEAPOLIS			

8 7 6 5 4 3 2 1